

Over 20 Reproducible Tornado Science Worksheets

TERRIFYING TORNADOES!

**GRADES
3-6**

Storm Science Activity Book



**The Science of History's Most
Catastrophic Tornadoes**

**Thrill Students
with the Subjects
They Love!**

Written by: Jennifer Boudart
Illustrated by: Kathy Giuffre
Edited by: Mary Susnis
Interior design by: Ellen Hart
Cover design by: Dave Metzger

© 2001 Learning Resources, Inc., Vernon Hills, Illinois (U.S.A.)
Learning Resources Ltd., King's Lynn, Norfolk (U.K.)

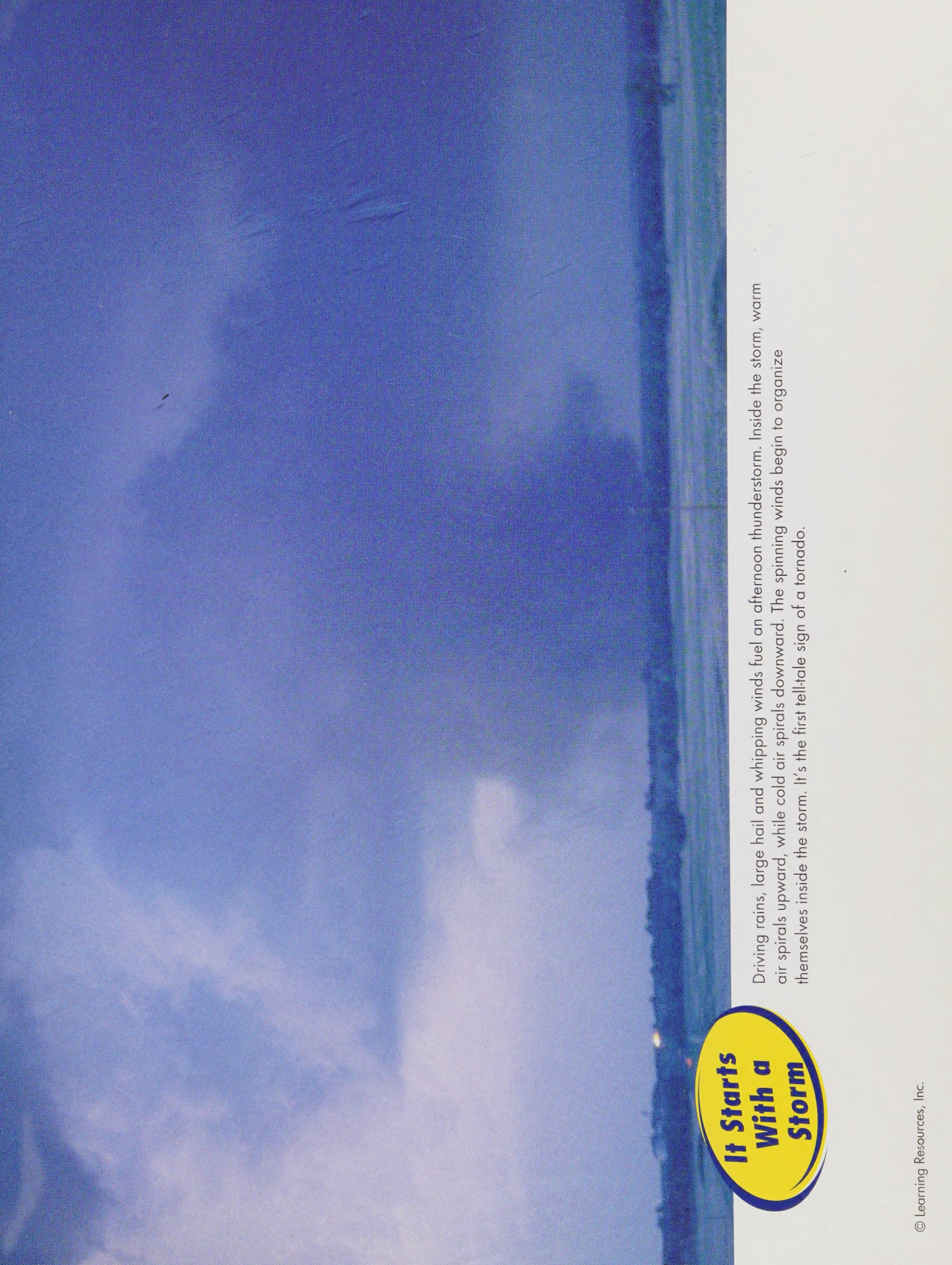
All rights reserved. This book is copyrighted. No part of this book may be reproduced, stored in a retrieval system, or transmitted in any form or by any means electronic, mechanical, photocopying, recording, or otherwise, without written permission, except for the specific permission stated below.

Each blackline master is intended for reproduction in quantities sufficient for classroom use.
Permission is granted to the purchaser to reproduce each blackline master in quantities suitable for noncommercial classroom use.

Radar image on front cover is provided courtesy of NOAA Photo Library.

ISBN: 1-56911-727-6

Printed in China



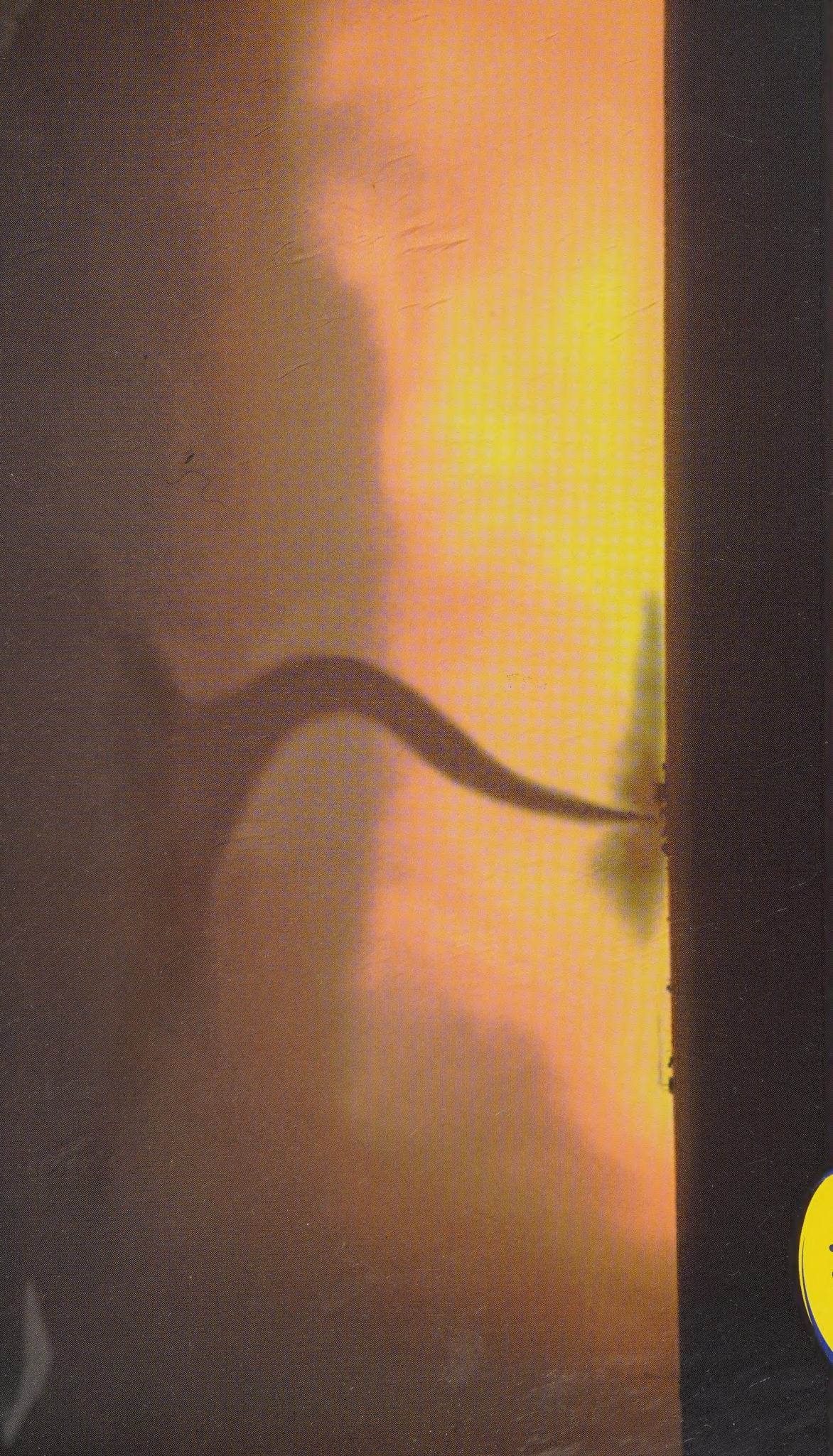
It Starts With a Storm

Driving rains, large hail and whipping winds fuel an afternoon thunderstorm. Inside the storm, warm air spirals upward, while cold air spirals downward. The spinning winds begin to organize themselves inside the storm. It's the first tell-tale sign of a tornado.



In less than 10 minutes, the spinning winds have created a vortex, or funnel cloud. Inside the vortex, winds whip around at speeds anywhere from 40 miles per hour (64 kph) to more than 300 miles per hour (480 kph). Dropping air pressure inside the vortex makes winds rotate even faster. The vortex is "growing" down from the clouds. If it comes in contact with the ground, it will officially become a tornado.





Terrifying Touchdown...

The funnel cloud touches down. A tornado is now underway. The funnel cloud "skips" along the ground, sucking up everything in its path. The tornado's forward speed is sometimes close to zero miles per hour, sometimes as fast as 70 miles (113 km) per hour. People must not try to outrun the tornado, but must seek shelter instead. The tornado whips around cars, building materials, trees, household items, even animals. It blows apart buildings and brings hail, lightning, and flash floods.



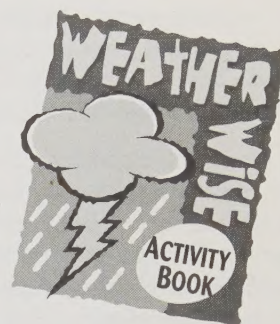
After The Storm

As with most tornadoes, this one breaks up in less than two hours. With wind speeds of more than 200 miles per hour (320 kph), the tornado released an amount of energy similar to a pair of nuclear reactors! All that energy was concentrated in the narrow funnel cloud. The path of damage the tornado creates is miles long, but less than half a mile wide. Houses on one side of a street are destroyed, while those on the other side are untouched. The tornado has caused millions of dollars of damage. Thanks to good warning systems, injuries and deaths are few. It is all too easy to see why tornadoes are known as the most powerful weather disasters.

Introduction

Weather makes a great subject for study. It's always happening just outside the window, and it's always changing. Weather affects us all, daily and seasonally. It ties into many areas of our lives—and, as a result, many areas of the school curriculum.

Weather Wise activity books focus on weather's dramatic, disastrous side. They teach students the science behind various weather phenomena, as well as their social impact. Activities are designed to support National Education Standards; they cover such concepts as weather patterns, measuring and quantifying data, science and technology, personal health and safety, and natural hazards and associated risks.



Each Weather Wise book kicks off with four pages of full-color photographs. Each image captures an important aspect of a severe weather event. The photographs may spark discussion about students' personal experiences, or about a recent event that made the news. And, they can spark curiosity about why severe weather happens.

Students discover the answers to their questions as they read a story about how a severe weather event gets its start, what happens as it unfolds, and what happens when the weather clears. Each activity contains a paragraph of information that tells part of the story. This is followed by a hands-on activity to further explore concepts covered in the storyline.

In *Weather Wise: Terrifying Tornadoes!*, students follow the development, descent, and destruction of a fictional tornado. The book is organized into three units:

Unit 1: A Tornado is Born

Unit 2: The Tornado Touches Down

Unit 3: After the Storm

Each unit contains teaching notes that provide tips for presenting activities, as well as ideas for science fair projects. The six activities in each unit integrate science, math, social studies, geography, and language arts. Students practice using science tools and technology, on an individual and group basis. A quiz at the end of each unit allows for assessment of student learning.

Even if you don't live in "Tornado Alley," your students will learn to appreciate these awesome weather systems. They will place themselves in the shoes of others who have faced tornadoes in real life. They will be more aware of weather and its risks. And, they will have a foundation to explore more general topics, such as clouds, rain, climate, and weather prediction.

So enjoy this handy resource book! We hope it allows you to learn all about tornadoes from the safety of your classroom!



Getting Started

A good way to present the material in this book is to set up an experience station. Start by stocking the station with materials about tornadoes, weather patterns, weather forecasting, and tornado research (including research done by storm trackers and chasers). You might wish to create a display from the photos at the beginning of this book. Include a copy of the Tornado Safety Smarts handout (pages 30-31), and make copies for students to use throughout the activities.

Begin with a discussion about tornadoes. Generate a list of what students know and what they would like to know. Share the photos at the start of this book, along with the information on each page. Explain that students will have a chance to follow the story of a fictional tornado, from beginning to end. They will perform experiments and other activities to better understand this awesome weather event. Introduce students to the experience station; allow them free time to explore it. Tell students they will be involved in adding to the station over time.

Teaching the Unit

Begin each lesson by reviewing the storyline and defining vocabulary terms (which appear in boldface).

Lesson 1: Help students to understand the symbols that appear on their weather maps. You might also have students listen to weather forecasts throughout the week. If they have questions about weather prediction or events such as cloud formation or cold fronts, direct them to the experience station, the Internet, or other research resources. Students should conclude that cold fronts and areas of low pressure lead to precipitation, while warm fronts and areas of high pressure lead to more stable, warmer weather.

Lesson 2: If you teach younger students, you may wish to present this activity as a classroom demonstration. If you allow student groups to perform the experiment, help them to insert the smoking twine. Students will observe that, once they remove the cardboard square, the smoke will rise. That is because the air around it has been warmed (by the warm temperature of the glass), which makes the air less dense. As it rises into the jar above, it cools and stops rising.

Lesson 3: You may wish to follow up this activity with a discussion about where your state is located with regard to Tornado Alley, as well as how the topography of your area affects tornado formation.

Lesson 4: Have students work in groups. Help students locate appropriate resources such as the books and organizations listed on the Safety Smarts pages. Other resources are newspapers, magazines, or local meteorologists.

Lesson 5: Have students work in pairs. Students may need to use a lot of tape on the bottles to make sure they are secured. Students will see a characteristic funnel shape as the water drains from one bottle to another. It is important that students get water swirling to make the water drain in a funnel shape, just as spinning winds are required for a vortex to form inside a thunderstorm. Save these materials for Lesson 5 in Unit 2.

Lesson 6: Be sure students understand the mileage scale. Tell them to draw a line marking the path of the car as they answer each question; this will help when they add up mileage for the last question.

Once students complete all the lessons and the Weather Wise Wrap-Up, discuss this stage of tornado activity as a class. Predict what will happen next.



Science Fair Starters

1. Create a display that identifies different cloud types and the kinds of weather they precede. Use cotton balls and paint to model each cloud type.
2. Create a display that shows how a thunderstorm forms and how it gives rise to a tornado.
3. Graphically illustrate tornado activity in the United States; create a U.S. map and record the average number of tornadoes reported by each state each year. You might create a color code to identify states with low, medium, and high averages.

Lesson 1 A CHANGE IN THE AIR

It is late afternoon one spring day in the Great Plains. People watch the hazy skies. The weather forecast calls for thunderstorms. **Meteorologists** are tracking a **cold front** sweeping down from the Rocky Mountains. It has brought a mass of cold, dry air. This air is bumping into warm, wet air sweeping up from the Gulf of Mexico. The **barometric pressure** is dropping. Meteorologists know that cold fronts and areas of low pressure are where thunderstorms form. And where there is a thunderstorm, there is a chance for a tornado.

Study a weather map to learn more about symbols that describe weather events.

1. Collect one week's worth of weather maps from newspapers.
2. Use the chart below to identify areas of low and high pressure, cold fronts, warm fronts, and weather conditions around the country. Your map may show other symbols, as well.

Symbol	Meaning	Symbol	Meaning
H	High Pressure		Stationary Front
L	Low Pressure		Sunny
	Shower		Partly Cloudy
	Snow		Cloudy
	Rain		North Wind
	Thunderstorm		South Wind
	Cold Front		East Wind
	Warm Front		West Wind

3. Study the maps to answer the following questions.

- a. What kinds of weather take place near cold fronts? _____

- b. What kinds of weather take place near warm fronts? _____

- c. What kinds of weather take place near areas of low pressure? _____

- d. What kinds of weather take place near areas of high pressure? _____

Unit 1: A Tornado is Born

Lesson 2

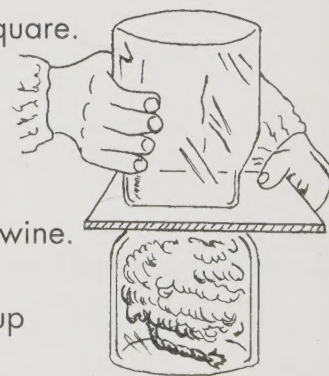
RECIPE FOR A THUNDERSTORM

The cold, dry mountain air flows over warmer air below it. Warm, wet air near the land's surface is pulled upward. It rises, because warm air is less **dense**, or lighter, than cold air. As the warm air hits the cold air, three things happen. Winds begin to swirl. The warm air grows cooler. Moisture released from the cooling air forms clouds. The clouds tower higher and higher. They are **cumulonimbus** clouds, or "thunderheads." A thunderstorm is about to begin.

Compare how warm and cold air behave.

You'll need: 2 glass jars of the same size, cardboard, scissors, twine, matches, hot and cold water

1. Cut a cardboard square that is large enough to cover the top of a glass jar.
2. With your teacher's help, run hot water from the sink. Adjust it until it is almost too hot to touch. Run the hot water over the outside surface of one jar.
3. Dry the outside of the hot jar and place it on a table. Cover the opening with the cardboard square.
4. Run cold water from the sink over the outside surface of another jar.
5. Dry the cold jar and place it upside down on top of the cardboard square. It should balance on top of the hot jar as shown.
6. Have your teacher light one end of a piece of twine, then blow out the flame. Lift the cardboard and slide the smoking twine into the hot jar on the bottom. When the jar is filled with smoke, pull out the twine.
7. Holding the top jar steady, slide out the cardboard square, and line up the mouths of the jars.



- a. What did the smoke do when the cardboard was removed?

- b. How did the air in the bottom jar compare to the air in the top jar? Why?

- c. How did air temperature affect the way the smoke moved?

- d. What happened to the smoke when it hit the cold air?

Lesson 3 TORNADO ALLEY

It starts to rain. The thunderstorm grows stronger. It is "fed" by heat that is released when raindrops form and as warm air spins up from the ground into the clouds. Meteorologists watch the storm closely. After all, this part of the country is known as **Tornado Alley**. It has just the right landscape and wind conditions to help tornadoes form.

Map the location, landforms, and wind conditions that make up Tornado Alley.

Read the paragraph below about Tornado Alley. Use this information, along with an atlas, to complete the map.

Tornadoes strike every part of the United States. However, more than 75 percent of tornadoes strike in the following states: Arkansas, Illinois, Indiana, Iowa, Kansas, Missouri, Oklahoma, and Texas. This area of the country is called Tornado Alley. It has good conditions for tornadoes. Very cold, dry air from the Rocky Mountains runs into warm, moist air from the Gulf of Mexico. The air masses meet along a "dry line" that runs from the southwest to the northeast. Here, powerful thunderstorms develop. Winds can gain speed over the flat, open land, making it easy for tornadoes to form.



1. Shade in the states in Tornado Alley.
2. Label the Rocky Mountains and the Gulf of Mexico.
3. Label the arrows correctly to show movement of warm, moist air and cold, dry air.
4. Draw and label the dry line that runs from southwest to northeast through Tornado Alley.

Unit 1: A Tornado is Born

Lesson 4 **Tornado Q & A**

The sky is filled with towering, black clouds. There is heavy rain and strong, shifting winds. The **National Weather Service** watches the storm. It uses **satellites** and **radar** equipment to take pictures and collect data. The thunderstorm looks like it might produce a tornado. The National Weather Service decides to issue a tornado watch for the area.

As a group, hunt down these tornado facts.

Use the Internet and printed materials to answer the questions below. Your Tornado Safety Smarts pages also list helpful organizations and books.

1. What is the job of the National Weather Service?

2. What are some partners of the National Weather Service?

3. What is a tornado watch?

4. What is a tornado warning?

5. What is the average number of tornadoes that strike in the United States each year?

6. During what months do most tornadoes strike in the United States?

7. During what time of day do most tornadoes form?

8. How long do most tornadoes last?

9. What are the dangers of tornadoes?

Unit 1: A Tornado is Born

Lesson 5

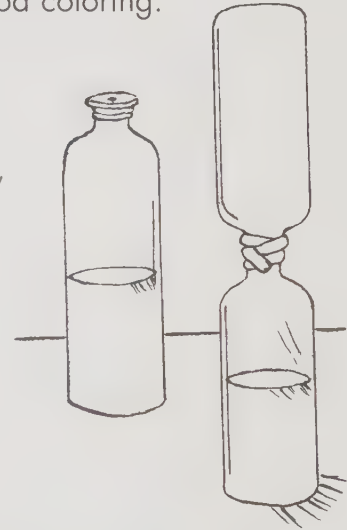
ROUND AND ROUND

Inside the thunderstorm, warm air keeps spiraling up. Then, cold air begins to spiral down. Within minutes, all this spinning air creates a **vortex**, or **funnel cloud**. The funnel cloud begins to "grow" down from the storm clouds. Inside the funnel, air pressure drops even more. This increases wind speed. The narrow tip of the funnel is where winds spin fastest. If the funnel cloud touches the ground, it will officially become a tornado.

Make a model of a funnel cloud.

You'll need: two plastic 2-liter soft drink bottles, washer, masking tape, food coloring, water

1. Remove the caps from two empty, 2-liter soft drink bottles.
2. Fill one soft drink bottle half-full with water. Add a few drops of food coloring.
3. Place a washer over the top opening of the bottle.
4. Turn another soft drink bottle over. Place it on top of the first bottle, so its mouth rests on the washer.
5. Wrap masking tape around the two bottles' necks. Use enough tape to keep either bottle from shifting.
6. Turn the bottles over so the water-filled bottle is on top. While holding the bottles, gently move them in a circular motion. The water should begin to swirl.
7. Place the bottles on a table. Watch the water drain from the top bottle to the bottom one.
 - a. What happened inside the top bottle as water drained out?
 - b. Where does the water seem to be moving the fastest?
 - c. How do you think the water's spinning action affected how fast it drained?
 - d. How does this experiment compare to the development of a funnel cloud?



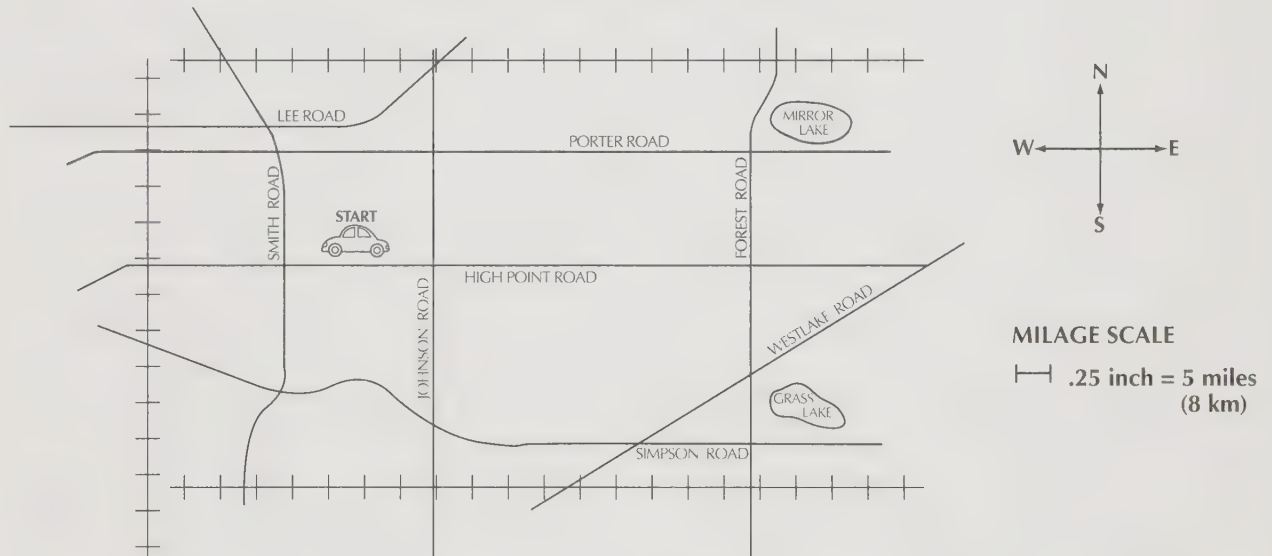
Unit 1: Tornado is Born

Lesson 6 **TORNADO TRACKERS**

A **storm tracker** has been following the storm in his car. Storm trackers are volunteers who "chase" thunderstorms that might develop into tornadoes. They carry **Doppler radar** equipment to measure wind speed and **rotation** inside storms. If the radar shows a funnel cloud forming, the tracker contacts the National Weather Service. That's exactly what this storm tracker does.

Learn more about storm trackers and the way they use Doppler radar.

Chart your path as you "chase" two thunderstorms through the area.



1. You are on High Point road driving west. You hear about a storm to the north of you. Which road do you turn on to head for the storm? _____
2. You are heading north to find the storm. You drive about 15 miles (24 km) and see clouds and rain. You see the storm is moving east. Which road do you turn on to follow the storm? _____
3. The storm seems to be weakening. You drive to a restaurant at the corner of Forest Road and High Point road. During lunch, you learn of a storm to the south. Which road do you take to find it? _____
4. You know the storm has been spotted near Grass Lake. About how many miles is it from the restaurant to the lake? _____

WEATHER WISE WRAP-UP

Use what you have learned in this unit to complete this page.

1. Mark each statement true or false.

- | | | |
|--|----------|----------|
| a. Areas of low pressure usually lead to thunderstorms. | T | F |
| b. Cold air is less dense, or lighter, than warm air. | T | F |
| c. Tornado Alley runs along the west coast of the United States. | T | F |
| d. Most tornadoes form in the late afternoon. | T | F |
| e. Inside a funnel cloud, winds spin fastest at the top. | T | F |

2. Fill in the blanks to complete these tornado facts.

Thunderstorms often form on the edge of a _____ front. When a cold, dry air mass flows over a warm, wet air mass, the _____ air rises upward. This causes the air to cool and lose moisture, which creates _____. During a strong thunderstorm, spinning winds form a _____. As it grows, the air pressure inside the vortex _____. This _____ wind speed. It turns into a tornado once it _____.

3. Answer these questions.

- What organization tracks tornado activity? _____
- What does a tornado warning mean? _____
- What is the name of a volunteer who watches for tornadoes? _____
- What is one state included in Tornado Alley? _____
- What is one reason so many tornadoes form in Tornado Alley? _____

4. Place these pictures in order from 1 to 5 to show how a tornado forms.





Getting Started

Add materials that were generated in Unit 1 to the tornado experience station. Gather information about the following topics to use for discussion and at the experience station: Bernoulli's Law, hailstones, tornado preparedness, school policy on tornado drills, the Fujita-Pearson scale.

As a class, discuss what students expect will happen next in the tornado's story. Share thoughts about what students would do if facing a tornado and how they would feel. You might show a movie, such as "Twister" or "The Wizard of Oz," to generate more discussion.

Teaching The Unit

Begin each lesson by reviewing the storyline and defining vocabulary terms (which appear in boldface).

Lesson 1: This experiment is based on Bernoulli's Law, which states that the faster a fluid moves, the less pressure it exerts. When differences in air pressure exist, these unbalanced forces cause movement. In the case of a tornado funnel cloud, high speed winds create an area of low pressure inside the tornado. Outside the tornado, air pressure is higher. This difference in air pressure creates a "sucking" action that draws air currents and objects inside the tornado, where they begin rotating at high speed. As students blow into the funnel, they increase air movement inside the funnel and lower the air pressure. Lower air pressure above the ping pong ball creates a lifting force. As a result, the ping pong ball is lifted off the table along with the funnel. Holding the funnel straight up and trying to blow out the ping pong ball is impossible for the same reason.

Lesson 2: If you do not have ready access to a freezer, you can present this activity as a demonstration or have students do it at home. Students should observe variations in color and thickness of "hailstone" layers. They should also appreciate how many layers are required to create a large hailstone from a single raindrop.

Lesson 3: Help students to answer questions about a school tornado drill. If possible, arrange for an actual school drill that students can report on. Otherwise, stage a drill. You might follow up this activity by having students complete a family disaster plan at home and bring in some of the items contained in their family's survival kit.

Lesson 4: Help students calculate average wind speeds for each level of intensity on the F-scale. You might challenge them to find facts about the speed of various moving objects in comparison with the wind speeds inside a tornado. To help students choose a list of adjectives that describe increasing levels of intensity, you might use the example of "goodness," which might include okay, good, great, excellent, outstanding, perfect.

Lesson 5: This experiment is an extension of the experiment used for Lesson 5 in Unit 1. Have students work in groups. They should observe that the glitter and confetti move more rapidly inside the vortex than near the bottle walls. Furthermore, they move in a circular direction. The glitter and confetti fail to spin if the water is not spinning first. You might follow up this activity by challenging students to find facts about some of the more bizarre objects lifted and carried by tornadoes.

Lesson 6: Students will likely be surprised to learn that an object's weight is not the only factor that determines how easily it is carried away by wind. Discuss other factors that affect an object's stability in blowing wind, such as its shape, the surface in contact with the ground, and the materials of which the object is made. Students should recognize that an F-2 tornado (with wind speeds of 113-157 mph/180-251 kph) would blow away every object except a brick chimney and a fertilizer tank.

Once students complete all the lessons and the Weather Wise Wrap-Up, discuss this stage of tornado activity as a class. Predict what will happen next.



Science Fair Starters

1. Create a diorama that displays the effects of a tornado.
2. Research and write about the lives of the people responsible for creating the Fujita-Pearson Scale.
3. Create a model building that can withstand the force of winds blowing from a leaf blower, or experiment with how different objects move in response to this wind force.

Lesson 1 IT'S A TWISTER

The funnel cloud touches down. It's now an official tornado, or twister. It begins to darken as it sucks up dirt and debris. Now, it looks like a stretched-out ice cream cone. The tornado "skips" along the Earth's surface, touching down for a few minutes at a time. The air pressure inside the twister is very low. Air pressure drops as wind speeds increase. This is called the **Bernoulli Effect**. Air pressure surrounding the twister is much higher. The difference in air pressure causes air and solid objects to be sucked up into the tornado.

Make a model to learn more about air pressure inside a tornado.

You'll need: ping pong ball, long-stem funnel

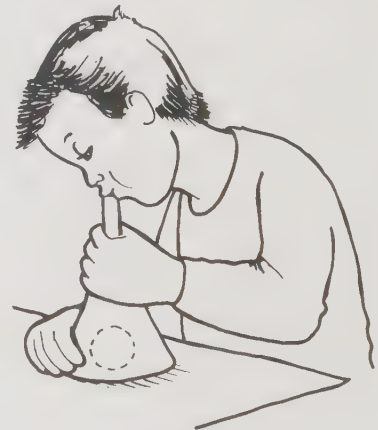
1. Place a ping pong ball on a flat surface.
2. Place a funnel over the ping pong ball, as shown.
3. Predict what will happen if you blow into the funnel and lift it up.
4. Blow through the stem of the funnel. At the same time, lift the funnel straight up.
 - a. What happened when you lifted the funnel?

 - b. What did blowing into the funnel do to the movement of air inside it?

 - c. How did this change air pressure inside the funnel?

 - d. Air pressure over the ping pong ball was lower than air pressure under the ping pong ball. How do your results prove this?

 - e. Try pointing the funnel straight up, placing the ping pong ball inside it. Can you blow the ball out of the funnel? Why do you think the ball acts the way it does?



Unit 2: The Tornado Touches Down

Lesson 2 **HIT BY HAIL**

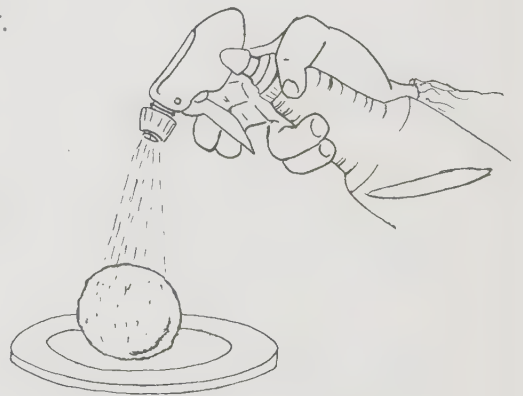
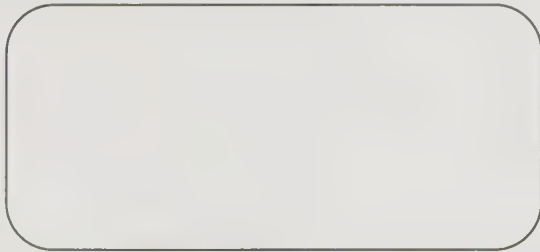
Several towns lie in the tornado's path. The tornado could strike in minutes. The tornado watch becomes a tornado warning. Police and emergency professionals prepare for action. People begin to take shelter. Before the tornado appears, the sky turns grayish-green. It starts to **hail**, a common side effect of tornadoes. Hail forms when raindrops freeze as they blow upward on strong updrafts of air. The drops fall and are coated with a layer of water. They're blown up again, and the water layer freezes. This cycle continues until a hailstone is too heavy and falls to the ground. Hailstones may reach the size of golf balls or even baseballs. They can injure people and damage property.

Model the formation of a hailstone by making one of your own.

You'll need: butter knife, small snowball or ice cube, hand-pumped water sprayer, freezer

1. Place a snowball or ice cube on a small plate, and set it in the freezer for five minutes.
2. Pull out the plate and spray the "hailstone" with water. Return the plate to the freezer.
4. Every five minutes, pull the hailstone out and spray it another time. Continue to do this for about half an hour.
5. Carefully cut the hailstone in half with a butter knife.

Draw a picture of what you see inside.



- a. How many layers can you count inside your hailstone? _____
- b. How do the layers of ice compare to each other? _____
- c. How much did the extra layers of ice affect the size of the ice cube or snowball?

- d. How many layers do you think it would take to create a hailstone the size of a golf ball?

Unit 2: The Tornado Touches DOWn**Lesson 3 TAKE SHELTER**

Tornado sirens begin to blast. People must seek shelter wherever they are. Those who are indoors head for the lowest level of the building. They find an inner room, hallway, or staircase to crouch down in. They place their hands over their heads. People who are on the road leave their cars. They get inside if they can. Otherwise, they lie down in a low area, with their hands over their heads.

Learn more about tornado safety at home and in school.

Learn how to stay safe during a tornado. Read your Tornado Safety Smarts pages, along with books and information on the Internet. Talk to your teacher about tornado safety at school (you've probably had tornado drills before).

Work with your teacher to answer these questions about tornado safety.

1. Has your school been inspected by an engineer? Is there an official shelter area? _____

2. How does your school stay tuned to weather information? _____

3. Who takes care of the alarm system? What happens if electricity fails? _____

4. How are disabled students taken care of during a tornado? _____

5. Who is trained in first aid to help injured people? _____

6. How often are school drills held? _____

7. What happens if a tornado threatens near the end of the school day?

8. When is it safe to leave the shelter area? _____

9. Hold a tornado drill at your school. Write about it here.



Unit 2: The Tornado Touches Down

Lesson 4 **TORNADO POWER**

How powerful is the tornado? That depends on its wind speed. Scientists cannot directly measure a tornado's wind speed. That would require placing instruments inside the tornado, something scientists haven't been able to do yet. Instead, the **intensity**, or power, of a tornado is measured by the damage it causes. This places it in one of six levels on the **Fujita-Pearson Scale** (or F-Scale, for short). Based on its behavior so far, this tornado is thought to be an F-3, or severe tornado.

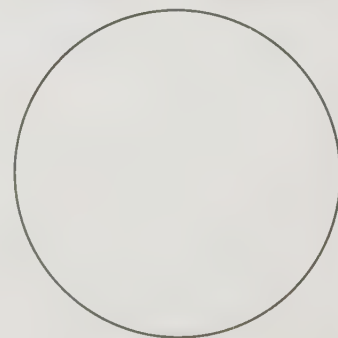
Learn more about how the intensity of a tornado is measured.

FUJITA-PEARSON SCALE

F-Scale Number	Intensity	Wind Speed	Damage	Duration
F-0	Gale Tornado	40-72 mph (64-115 kph)	chimney damage, tree branches broken	1-10 minutes
F-1	Moderate Tornado	73-112 mph (116-179 kph)	mobile homes shifted or overturned, roof shingles blown off, moving cars blown off road	1-10 minutes
F-2	Significant Tornado	113-157 mph (180-251 kph)	mobile homes demolished, trees uprooted, small flying objects become dangerous	20-60 minutes
F-3	Severe Tornado	158-206 mph (252-330 kph)	roofs and walls torn down, trains overturned, most trees uprooted	20-60 minutes
F-4	Devastating Tornado	207-260 mph (331-416 kph)	walls leveled, cars thrown, large flying objects become dangerous	60 minutes or more
F-5	Incredible Tornado	261-318 mph (417-509 kph)	homes lifted, carried and disintegrate, cars tossed at high speeds	60 minutes or more

- Look at the range of wind speeds for each level of intensity. What is the average wind speed for each level? F-0 _____ F-1 _____ F-2 _____ F-3 _____ F-4 _____ F-5 _____
- Look at the words used to describe a tornado's intensity at each level. Are these words you already know? How have you seen these adjectives used to describe other things?

- Think of four adjectives that describe an object or idea with increasing levels of intensity.
1. _____ 2. _____ 3. _____ 4. _____
- About 75 percent of all tornadoes fall into the F-0 to F-1 categories. About 24 percent fall into the F-2 to F-3 categories. Only 1 percent of tornadoes fall into the F-4 to F-5 categories. Turn this information into a pie graph.



Unit 2: The Tornado Touches Down

Lesson 5 TRAPPED IN A TORNADO

As the tornado travels, its winds pick up rocks, trees, cars, building signs, telephone poles, even animals. They toss around smaller objects, like roof shingles, books, and clothing. Everything spins around inside the tornado, turning in a counterclockwise direction. Even small objects become dangerous as they travel at high speeds. In fact, tornadoes have been known to drive a single blade of grass into a tree trunk!

Make a model to learn more about how objects fly inside a tornado's funnel.

You'll need: 2 plastic 2-liter soft drink bottles, washer, masking tape, water, glitter, confetti

1. Remove the caps from two empty 2-liter soft drink bottles.
2. Fill one soft drink bottle half-full with water. Add a handful of glitter and confetti.
3. Place a washer over the top opening of the bottle.
4. Turn another soft drink bottle over. Place it on top of the first bottle, so its mouth rests on the washer.
5. Wrap masking tape around the two bottles' necks. Use enough tape to keep either bottle from shifting.
6. Turn the bottles over so the water-filled bottle is on top. While holding the bottles, gently move them in a circular motion. The water should begin to swirl.



7. Place the bottles on a table. Watch the water drain from the top bottle to the bottom one. Watch how the glitter and confetti move.
 - a. Describe the movement of the glitter and confetti inside the "tornado."

 - b. Which moved faster, objects near the center of the funnel or objects near the bottle's wall? Why do you think so? _____
 - c. Flip the bottles again, but don't swirl the top bottle. How does the glitter and confetti move differently this time? Why do you think so? _____

Unit 2: The Tornado Touches Down**Lesson 6 WHAT GOES UP...**

Inside their homes, people listen as the tornado passes over. The noise is incredible. It sounds as if a freight train is right overhead. The sound comes from thunderclaps booming inside the tornado. The force of the wind passing over each building is enough to rip off rooftops. It blows down walls. Some buildings, like mobile homes, are lifted off the ground. Smaller flying objects punch holes in buildings, too. The flying debris from tornadoes causes the most death and injuries. That is why it is so important to stay low and to stay away from windows.

Learn more about how winds blow objects around during a tornado.

Look at the chart below. It lists examples of different objects and how much they weigh. Next, look at the list of wind speeds. Try to guess which wind speed is strong enough to pick up each object. Write the letter for each guess in the chart. Check your answers with your teacher.

Object	Weight	Your Wind Speed Guess	Actual Wind Speed
small mobile home	4,800 lbs./2,179 kg		
brick	3 lbs./1 kg		
plywood	95 lbs./43 kg		
small car	2,000 lbs./908 kg		
concrete block	40 lbs./18 kg		
brick chimney	390 lbs./177 kg		
large mobile home	39,200 lbs./17,797 kg		
fertilizer tank	26,000 lbs./11,804 kg		

Wind speed

A. 31 mph/50 kph B. 54 mph /90 kph C. 56 mph/141 kph D. 88 mph/141 kph
 E. 99 mph/158 kph F. 105 mph/168 kph G. 197 mph /315 kph H. 202 mph/323 kph

- How many of your guesses were correct? _____
- What surprised you most about the actual answers? _____
- Why do you think some objects are more easily blown away than others? _____

- Refer to the wind speeds listed on the Fujita-Pearson Scale on page 18. Which objects would be blown around in an F-1 tornado? _____

Unit 2: The Tornado Touches Down**WEATHER WISE WRAP-UP**

Use what you have learned in this unit to complete this page.

1. Circle the correct answer.

- a. The most powerful tornado rating on the F-Scale is:
 - A. F-0 C. F-6
 - B. F-1 D. F-5
- b. Hail forms when a raindrop:
 - A. is blown downward through cold air C. combines with snow
 - B. rises and falls, freezing and re-freezing D. none of these
- c. If you are inside your home during a tornado, you should:
 - A. kneel with your hands on your head C. stay away from windows
 - B. cover yourself with a mattress or other shielding object D. all of these
- d. An F-5 tornado has wind speeds reaching more than:
 - A. 300 mph (483 kph) C. 700 mph (1,126 kph)
 - B. 100 mph (161 kph) D. 200 mph (322 kph)

2. Mark each statement true or false.

- | | | |
|---|----------|----------|
| a. Tornadoes with F-4 or F-5 ratings strike most often. | T | F |
| b. The more intense a tornado, the longer it lasts. | T | F |
| c. A tornado's "sucking" action is due to high air pressure inside the tornado. | T | F |
| d. During a tornado, the lowest level in a building is safest. | T | F |
| e. People on the road should stay in their cars and drive away from a tornado. | T | F |

3. Answer these questions.

- a. Where do you go during a tornado if you are in school? _____
- b. What is one of the things the Fujita-Pearson scale measures? _____
- c. What is one of the signs that a tornado is on the way? _____
- d. What causes the most deaths and injuries during a tornado?

- e. What is one thing you should **not** do during a tornado?





Getting Started

Add materials that were generated in Unit 2 to the tornado experience station. Gather information about the following topics to use for discussion and at the experience station: tornado survivor stories, U.S. tornado history, disaster relief organizations.

As a class, discuss what students expect will happen next in the tornado's story. Share thoughts about how a tornado would change life at the individual and community level.

Teaching Tips

Begin each lesson by reviewing the storyline and defining vocabulary terms (which appear in boldface).

Lesson 1: You may wish to complete this activity as a class, using a local map for reference. Or, you can ask students to complete this activity with the help of a parent or other adult. Students will need to be able to measure the distance from the school to each point on the map. Ask students to list at least one structure and one landmark for each point. Students should determine that the point representing the most heavily populated area is where most damage would occur. Help them to determine which point this is. You may also wish to discuss how actually driving the distance included in the tornado's path of damage gave students a better sense of the possible extent of a tornado's effects on their community.

Lesson 2: The American Red Cross has statistical information on its Web site regarding disaster relief that you can use for further discussion about the cost of tornadoes.

Lesson 3: Help students research tornadoes that have struck the U.S. in the last century. They may not be able to fill out every piece of information in the chart, but they should get a sense of the fact that deaths have dropped in recent years due to better warning and detection technology. Damage may increase due to more population. If your town has experienced a tornado, help students locate newspaper stories about the event.

Lesson 4: Help students locate printed materials and web sites that carry photos related to tornado damage. Students may need to make photocopies for the activity. Encourage them to collect at least three photos, and to use the back of their handout if more space is needed. Direct students to use the classic formula for writing captions in a newspaper style: details should include Who, What, Where, When, Why, and How.

Lesson 5: For this activity, you may wish to read a fictional story about a tornado as a class. Select a book from the reading list on page 30. Or, you can find survivor stories on the Internet. If you live in an area where tornadoes occur, you might locate newspaper articles or even residents who have lived through a tornado to share stories with you. Be sure to allow time for students to share their stories and photos from Lesson 4. You may wish to make a classroom display.

Lesson 6: Have students work in groups. Help them choose an organization to research and decide how to gather information. You may wish to contact local offices of organizations listed on page 31. Or, you can find information and guidelines regarding disaster relief organizations on-line at www.charityguide.org. Students may contact their organizations via phone or e-mail. A representative may even be willing to come speak to the class. As a culminating activity for this lesson, have students design a tornado-themed magazine that includes not only a story about the volunteer event, but safety tips, survivor stories, statistical information, and photographs.

Once students complete all the lessons and the Weather Wise Wrap-Up, discuss this stage of tornado activity as a class. Predict what will happen next.



Science Fair Starters

1. Make a model of a tornado that includes flying objects. You might use a coil of flexible wire, along with cotton batting and miniature craft objects for your model.
2. Research how the cost of tornadoes is estimated. Create a graphic display of results.
3. Interview a relief organization representative about how a donation is received and distributed. Then create a visual display that outlines the "journey" of one person's disaster relief donation.

Unit 3: After The Storm

Lesson 1

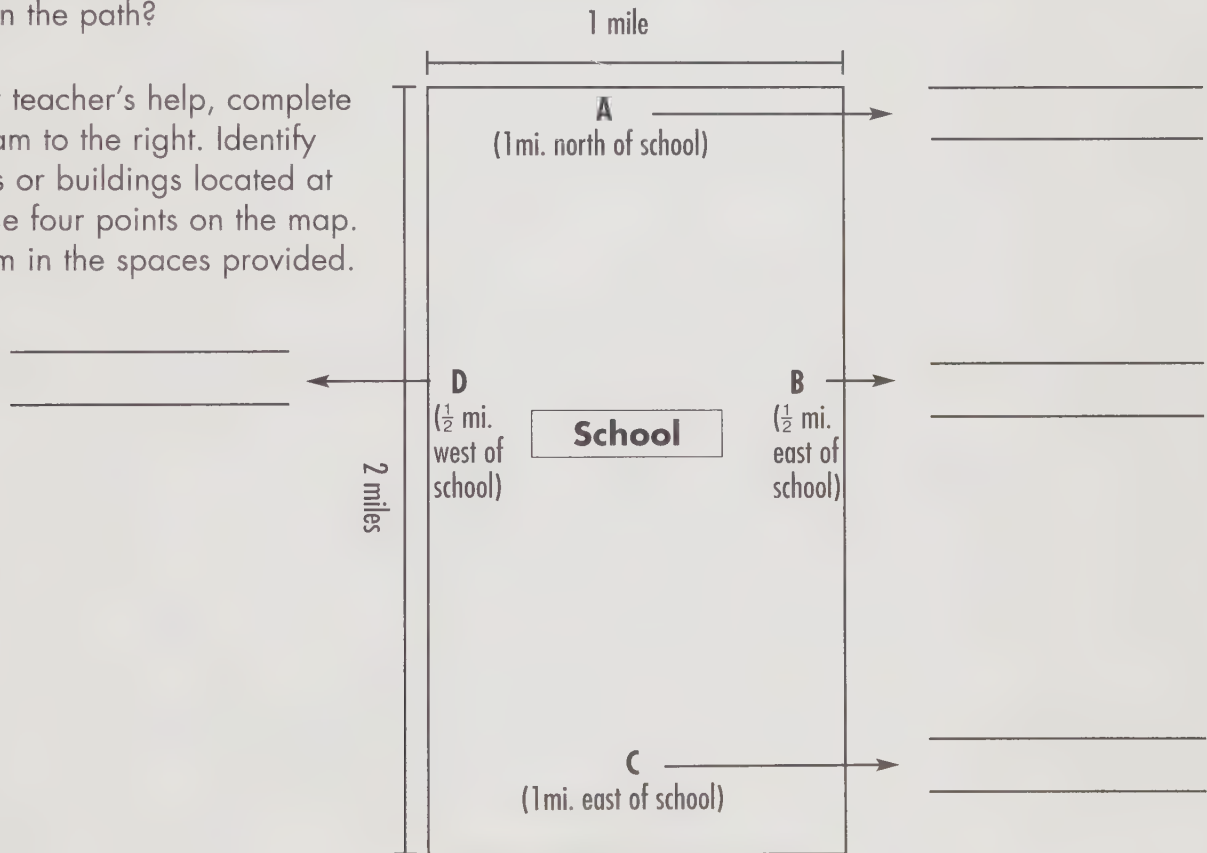
THE TORNADO'S TRAIL OF RUIN

Suddenly, the winds die down. The tornado has passed. It leaves behind a path one-quarter mile (0.4 km) wide and 10 miles (16 km) long. The path is marked by flattened houses, torn-up trees, overturned railroad cars, and piles of debris. Some areas are flooded. All this damage happened during the 20 minutes or so the tornado took to rip through the area. This was in fact an F-3, or severe tornado.

Map an imaginary tornado's path of damage as it passes your school.

Imagine a tornado leaves a path of damage one mile (1.6 km) wide and two miles (3 km) long. Your school is in the center of this path. What other areas of your community would be included in the path?

With your teacher's help, complete the diagram to the right. Identify landmarks or buildings located at each of the four points on the map. Write them in the spaces provided.



1. What surprised you most about the area covered by the map? _____

2. Based on your map, where would the tornado cause the most damage? (Circle one.)

school

Point A

Point B

Point C

Point D

Explain your answer. _____

Unit 3: After The Storm

Lesson 2 **TWISTED MATH**

The tornado makes national news. Reports tell of the tornado's size, strength, and effects. Officials from local, state, and federal governments visit the area. They begin to calculate the tornado's cost. The cost goes beyond damage to private and public property. It also involves taking care of people who have been hurt or left homeless. It involves money lost by businesses that shut down for repairs and replacing goods. Everyone who lived through the tornado will feel its costly effects.

Solve these word problems about the tornado and its effects.

1. The tornado moved forward at speeds ranging from 10 miles per hour (16 kph) to 64 miles per hour (102 kph). What is the difference between its slowest speed and its fastest speed? _____
What is the tornado's average forward speed? _____
(Hint: To average, add the windspeeds. Then divide by the number of windspeeds that you added together.)
2. The tornado left a path of damage one-quarter mile (0.4 km) wide and 10 miles (16 km) long. What is the total area included in the path of damage? _____
(Hint: Area = length x width)
3. The tornado alarm siren blew at 5:10:03 p.m. The tornado struck at 5:13:16 p.m. How many seconds passed before the tornado struck? _____
4. The tornado killed 3 people and injured 681 people. How many people were injured for every person that was killed? _____
5. The tornado picked up a hotel sign and carried it 4,000 feet (1,220 km) before dropping it. This distance is closest to (circle one):

A. 0.25 mile (0.4 km) B. 0.5 mile (0.8 km) C. 0.75 mile (1.2 km) D. 1.0 mile (1.6 km)
6. The tornado destroyed many businesses. One gas station owner closed his business for ten days to make repairs. He figured he lost \$13,000.00 in sales each day. How much money did he lose during the ten days the station was closed? _____

Unit 3: After The Storm

Lesson 3 A TORNADO MAKES HISTORY

The tornado will be recorded as the fourth tornado to hit this state this year. It is not the worst tornado ever to strike. Still, it has caused millions of dollars of damage. It has killed several people and injured hundreds more. Communities hit by the tornado hope they can recover before another one strikes.

Research some tornadoes that have struck in the last century.

Gather information to complete the chart below.

Date of Tornado	Location	F-Scale Rating	Number of Deaths	Cost of Damage

1. What do you think affects how much damage a tornado causes?

2. Has your town ever experienced a tornado? Explain your answer.

Look at these statistics about tornado-related deaths.

Time Period	Number of Tornadoes Killing 18 people or more
1950s	18
1960s	12
1970s	11
1980s	2

3. What is happening to the number of deaths over the years? _____

4. Why do you think numbers are going down? _____

Unit 3: After The Storm**Lesson 4 A SURVIVOR'S STORY: PART 1**

The tornado "lived" less than a half hour before losing energy and breaking apart. However, it changed many lives forever. It blew apart buildings and blew away family treasures. It destroyed some homes, leaving others nearby totally untouched. People have been injured, and a few have even died. The town will take weeks to get back to normal. The tornado's cost—both financial and emotional—is very high.

Collect pictures that show the deadly damage a tornado causes.

Find pictures taken after a tornado, and place a few on this page. Look through magazines, books, and Internet sites. Cut out photos, make copies, or print out pictures to use. Write a caption below each picture that gives information about what happened.

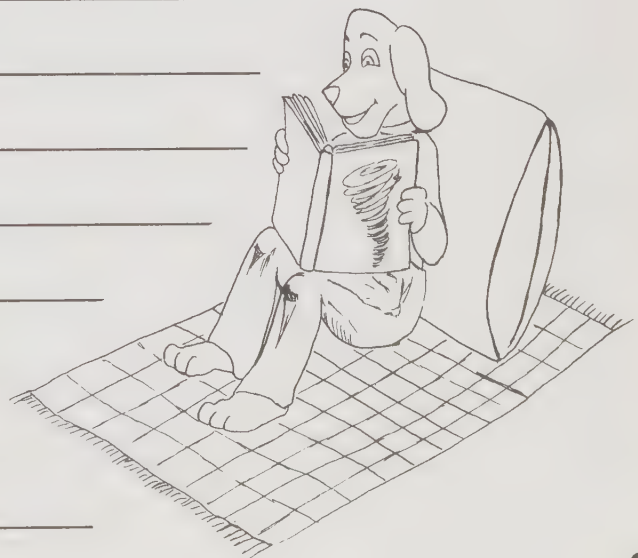


Lesson 5 A SURVIVOR'S STORY: PART 2

People begin to sort through the rubble of their homes and businesses. They save what they can: clothes, a doll, pictures, books. The tornado dumped many items miles from where it sucked them up. Cars lie upside down. A hotel sign sits in someone's lawn. A couch rests in the middle of the street. People talk about seeing the funnel cloud, watching things fly through the air, and hearing the roar of the wind. All tornado survivors will remember this day for the rest of their lives.

Imagine living through a tornado. Write your story here.

Read stories about people who lived through tornadoes. Find survival stories in magazines, books, or on the Internet. The reading list included in your Tornado Safety Smarts pages lists several books to choose from. As you write your story, think about what you might experience before, during, and after the tornado. How is your life changed?

A black and white line drawing of a dog sitting on a checkered blanket. The dog is holding an open book and looking at it. The dog is wearing a collar. The background is a plain white surface.

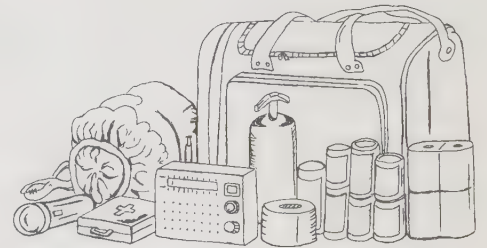
Unit 3: After The Storm

Lesson 6 **HELPING HANDS**

Who will pay for the cost of rebuilding after the tornado? The government declares the tornado site a **disaster area**. As a result, it will send money to help. Insurance companies will also help cover the cost. Relief organizations will raise money, too. They will also send donations like food, medicine, and clothing. These items may come from around the country to help out the tornado victims.

Find out how relief organizations help people in need.

When a disaster strikes, people near and far want to help. They may want to make a donation, but aren't sure if it will reach the right people. With your group, find out how a relief organization helps disaster victims. Choose an organization listed on your Tornado Safety Smarts pages. Or, search your local phone book or the Internet. Use e-mail, the telephone, or the regular mail to gather the information below.



1. Organization name: _____
2. Organization's goal: _____

3. Types of relief provided: _____

4. Nations where organization sends relief: _____

5. How the public can make donations: _____
6. How people can volunteer: _____
7. Examples of disasters the organization has responded to: _____
8. Use the information you have gathered to make a poster about volunteering and making donations.

WEATHER WISE WRAP-UP

Use what you have learned in this unit to complete this page.

1. Describe how a tornado forms. _____

2. Describe how a tornado causes damage. _____

3. Describe how tornadoes can be dangerous to people. _____

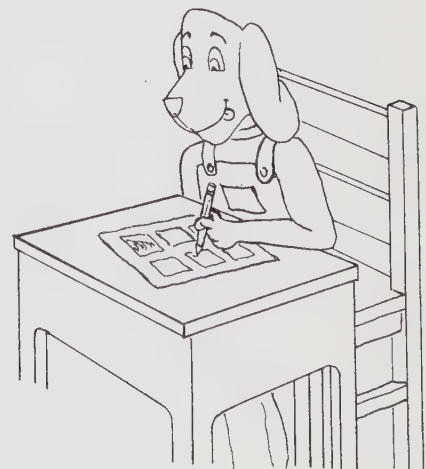
4. Describe how people should keep themselves safe during a tornado. _____

5. Describe how a tornado might affect a person's life. _____

6. Name one organization that helps tornado victims. _____

7. How can people help victims in any disaster?

8. Explain how your thinking about tornadoes has changed.



Tornado Safety Smarts

Get wise about wild weather like tornadoes! Follow the safety tips for being prepared before, during, and after a tornado strikes. Learn more about tornadoes and people's experiences with them, too. Check out organizations and books about tornadoes too!

TORNADO SAFETY CHECKLIST

Before a Tornado...

Develop a Family Disaster Plan.

- Learn about your town's warning signals. Find out where tornado shelters are located. Call your local American Red Cross chapter or the local National Weather Service office for information.
- Decide where to take shelter in your house if a tornado strikes.
- Place emergency numbers by all phones.
- Decide what to do if you are not all together during a tornado or other disaster. Choose a place in your neighborhood to meet. Also, choose a family member or friend to call.
- From time to time, review the disaster plan.

Put together a tornado survival kit.

- It's a good idea to keep a survival kit in case of any kind of disaster. Each person must pack supplies to last three days. Supplies should be stored in a backpack or gym bag and should include:
 - _____ three-day supply of water (one gallon per person, per day)
 - _____ food that will not spoil
 - _____ one change of clothing and footwear per person
 - _____ one blanket or sleeping bag per person
 - _____ a first aid kit
 - _____ emergency tools, including a battery powered radio, flashlight, extra batteries
 - _____ extra set of car keys
 - _____ special items needed for babies, older people, or people with health problems
 - _____ hygiene supplies, such as toothbrush, washcloth, soap, toothpaste
 - _____ a waterproof container to hold important family papers
- Keep a smaller kit in the trunk of your car.
- Replace stored food and water every six months.

Take part in practice tornado drills at school.

Stay tuned to weather reports.

- Listen to the radio or watch television for reports put out by the National Weather Service. Also listen for alarm sirens.

TORNADO-RELATED READING

Berger, Melvin. *Tornadoes Can Make It Rain Crabs: Weird Facts About the World's Worst Disasters*. New York, NY: Scholastic, 1997.

Challoner, Jack. *Eyewitness: Hurricane & Tornado*. New York, NY: Dorling Kindersley Publishing, Inc., 2000.

George, Jean Craighead. *One Day in the Prairie*. New York, NY: Harper Row, 1996.

Givens, Steven J. *Tornado Warning: A Triangle Club Adventure*. New Canaan Book Publishing Company, Inc., 1997.

Kahl, J.D. *How's the Weather—Storm Warning: Tornadoes and Hurricanes*. Minneapolis, MN: Lerner Publications Co., 1993.

Kramer, S. *Nature in Action: Tornado*. Minneapolis, MN: Carolrhoda, 1992.

Lampton, C. *Disaster! Tornado*. Brookfield, CT: Millbrook, 1991.

Morris, Neil. *Wonders of Our World: Hurricanes & Tornadoes*. New York, NY: Crabtree Publishing, 1998.

Rose, Sally. *The Weather Channel: Tornadoes!* New York, NY: Simon Spotlight, 1999.

Ruckman, Ivy. *The Night of the Twisters*. New York, NY: Harper Row, 1986.

- If a tornado watch is in effect, a thunderstorm has been spotted that may produce a tornado. The storm is expected to reach the area under the watch within a few hours. If a tornado warning is in effect, a tornado has been sighted or Doppler radar has shown signs of tornado formation inside a storm.
- If you hear a tornado warning, decide how you will make yourself safe. If you are at home, store some extra water in case clean drinking water is not available after the tornado.

During a Tornado...

Stay Tuned to Weather Reports

Make yourself safe.

If you are at home...

- Stay inside.
- Stay away from windows.
- Go to the lowest floor, such as the basement. If there is no basement, find an inner room without windows, such as a bathroom, hallway, or closet. Stay away from corners of the room, where flying debris is most likely to land.
- Cover yourself with a mattress, heavy clothing or blankets to protect your body from flying objects. Or, crawl beneath a heavy, sturdy piece of furniture. Kneel on the floor, facing the wall. Put your hands over your head.

If you are at school or in another public building...

- Go to interior rooms and halls on the lowest floor. Or, find a stairway in the middle of the building.
- Stay away from areas surrounded by glass.
- Stay away from areas covered by large, flat roofs, such as cafeterias.
- Crouch down and cover your head.

If you are in a car or in a mobile home...

- Do not stay inside a car or a mobile home. Most people who die in tornadoes are inside a car or a mobile home.
- Find a sturdy building or get to a tornado shelter.

If you are outdoors, away from a safe building...

- Find the lowest area possible, such as a ditch.
- Lie flat. Cover your head with your hands.
- Watch for flood waters.

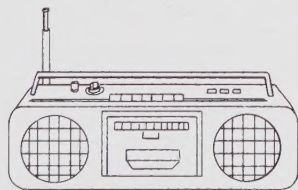
After a Tornado...

Stay tuned to weather reports.

- Avoid damaged buildings.
- Return home only when your area is officially safe.

Travel with care.

- Roads may be closed. Do not cross road blocks.
- Avoid bridges and washed out roads. Do not drive into flooded areas.
- Do not move around in water more than six inches deep.
- If you find someone who is hurt or trapped, give first aid or help if you can. Don't try to move injured people. Call for help instead.



Check for home damage.

- Check gas, water, and electrical lines for leaks or damage.
- Walk carefully, and watch for shifting or falling items.
- Clean up spilled household chemicals that might cause a fire. If you smell strong chemical odors, leave the house.
- Take pictures of damage to the house and property inside for insurance purposes.
- Don't drink or cook with tap water until you know it is safe.
- Don't use the telephone unless you have a life-threatening emergency.

Check on neighbors who might need special help, such as senior citizens, disabled people, or people with babies.

TORNADO-RELATED ORGANIZATIONS

Relief

American National Red Cross
www.redcross.org

Doctors Without Borders
www.dwb.org

Humane Society of the United States
<http://www.hsus.org/>

Federal Emergency Management Agency
<http://www.fema.gov>

National Voluntary Organization Active in Disasters
<http://www.vita.org/nvoad>

Salvation Army
www.salvationarmy.org/

Research

National Oceanic Atmospheric Administration
<http://www.noaa.gov>

National Severe Storms Laboratory
www.nssl.noaa.gov

National Weather Service
<http://www.nws.noaa.gov/>

SKYWARN
www.skywarn.org/

Storm Prediction Center
www.nssl.noaa.gov/~spc

United States Army Corps of Engineers
www.usace.army.mil/inet/functions/cw

Answer Key

Selected Answers

Unit 1

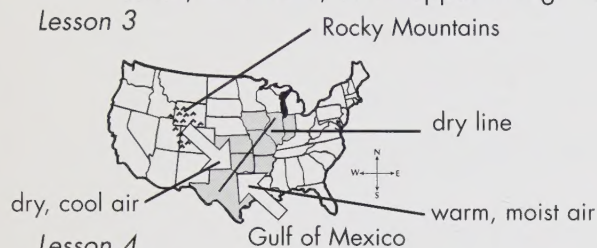
Lesson 1

- cooler temperatures, usually some form of precipitation (rain, snow, etc.)
- warmer temperatures, more stable weather
- cooler temperatures, usually some form of precipitation
- warmer temperatures, more stable weather

Lesson 2

- The smoke rose., b. It was warmed by the warm temperature of the glass., c. Warm air is less dense, so it rises., d. It stopped rising.

Lesson 3



Lesson 4

- The National Weather Service monitors weather conditions and informs the public about severe weather events., 2. media, universities, storm trackers, law enforcement, public safety officials, and other research organizations, 3. a severe thunderstorm is forming that could bring a tornado to the area within a few hours, 4. a tornado has been sighted in the area or radar images show the beginnings of funnel cloud formation
- an average of 1,000 tornadoes,
- during the spring in the southern states, during the summer in the northern states,
- late afternoon or early evening,
- most last between 10 minutes and 2 hours,
- flying debris, lightening, hail, and flash floods

Lesson 5

- The water forms a funnel., b. in the center of the funnel, c. it helped the water drain faster, d. Spinning winds are needed to form a vortex inside a thunderstorm.

Lesson 6

- north on Smith Rd. 2. east on Porter Rd.
- south on Forest Rd. 4. about 20 miles (32 km) to Grass Lake

Weather Wise Wrap-Up

- a. T b. F c. F d. T e. F
- cold, warm, clouds, vortex or funnel cloud, drops, increases, touches ground
- a. National Weather Service b. A tornado has been sighted or a funnel cloud is forming. c. storm tracker d. Possible answers: Arkansas, Illinois, Indiana, Iowa, Kansas, Missouri, Oklahoma, Texas e. Possible answers: flat open land where cold and warm moist air masses meet. 5. (from left to right) 2, 5, 1, 3, 4

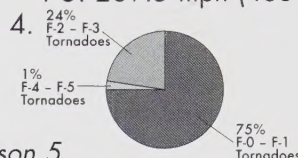
Unit 2

Lesson 1

- The ping pong ball was lifted. b. There is increased air movement. c. It created lower air pressure. d. It created a lifting force. e. It is impossible because of the low air pressure.

Lesson 4

- F-0: 55 mph (88 kph), F-1: 92.5 mph (148 kph), F-2: 135 mph (216 kph), F-3: 182 mph (291 kph), F-4: 233.5 mph (373.5 kph), F-5: 289.5 mph (463 kph)



Lesson 5

- It moves more rapidly., b. Glitter near the center moves more quickly., c. The glitter does not spin.

Lesson 6

- small mobile home B. (54 mph/86 kph), brick C. (56 mph/90 kph), plywood A. (31 mph/50 kph), small car F. (105 mph/168 kph), concrete block E. (99 mph/158 kph), brick chimney, G. (197 mph/315 kph), large mobile home D. (88 mph/141 kph), fertilizer tank H. (202 mph/323 kph)

Weather Wise Wrap-Up

- a. D, b. B, c. D, d. A
- a. F, b. T, c. F, d. T, e. F
- Possible answers: a. to a staircase or hallway, b. wind speed, damage, duration, intensity, c. green skies, hail, rain, stillness in the air d. Flying objects e. Possible answers: stay in a car or mobile home, stand near windows, stay at the highest floor, go to areas topped with high, flat roofs.

Unit 3

Lesson 2

- 54 mph (86 kph), 37 mph (59 kph) 2. 2.5 square miles (6.4 square km) 3. 193 seconds 4. 227 people injured for every person killed 5. 7 6. C 7. \$130,000.00

Lesson 3

- Possible answers: wind speed, intensity, duration, 3. The number of deaths is decreasing., 4. Possible answers: better detection and warning technology

Weather Wise Wrap-Up (Possible Answers)

- winds inside a thunderstorm start spinning and form a funnel cloud that grows down from the clouds and touches ground, 2. wind blows down objects, flying debris crashes into objects, 3. flying debris can hit people, houses can collapse on top of people, people in cars can be lifted and thrown, 4. stay inside away from windows, crouch down, If outside, lie down in a low area, 5. it could hurt or kill someone, ruin a person's home, or schools, stores, and offices, 6. Answers will vary., 7. send money, food, or clothing, 8. Answers will vary.

Calling All Storm Chasers!



Terrifying Tornadoes!

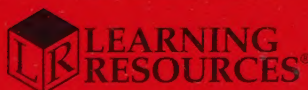
Track a terrible twister's path of destruction while discovering the origins and extent of tornadoes' devastating power.



Actual disaster facts and full-color photos launch complete investigations of severe weather phenomena in these engaging activity books. Study accounts of recent disaster events and complete earth science, physical science, math, and research activities. Each 32-page book includes science experiments, lab activities, data tables, group research projects, science fair ideas, and essential weather safety tips for Grades 3-6.

LER 2146 Historic Hurricanes!
LER 2148 Frightful Floods!

LER 2149 Striking Lightning!
LER 2154 Weather Wise Library Set



For a dealer near you, call:
(800) 222-3909 (U.S. & Canada)
+44 (0)1553 762276 (U.K. & Europe)

Visit our web site:

www.learningresources.com

© Learning Resources, Inc., Vernon Hills, IL (U.S.A.)
Learning Resources Ltd., King's Lynn, Norfolk (U.K.)
Please retain our address for future reference.
Printed in China.

ISBN 1-56911-727-6



7 650231 02147 9